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## (54) RUNNER SHOE FOR SNOWMOBILE

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ABSTRACT OF THE DISCLOSURE

The disclosure herein describes a runner blade adapted to be secured to the underface of a snowmobile ski; the blade consists of a longitudinal rigid member with spaced-apart bolts secured on its upper part for fastening the blade to the ski and with a groove longitudinally extending in its lower part and receiving a plurality of adjacent pieces of cemented carbide. Each carbide has its upper faces brazed to corresponding faces in the groove and its lower faces defining a cutting edge extending below the rigid member and adapted to cut into the icy surface over which the snowmobile runs; a preferred carbide is a tungsten carbide known under the trademark "Carboloy". In providing increased steering control to the skis, an important safety feature is now added to the snowmobile; furthermore, such a construction greatly simplifies the assembling of the blade to the ski and offers a sturdier assembly to oppose lateral forces exerted on the blade.

This invention relates to an improved ski assembly for use in a snowmobile; more particularly, this invention pertains to an improved runner blade adapted to be secured to the underface of a snowmobile ski.

Driving a snowmobile has become a popular sport and its popularity is continuously increasing; however, the accidents occurring in conjunction with this type of vehicle have also increased quite drastically. It has been found that one of the major causes for snowmobile accidents has been the failure of the snowmobile to quickly respond to a turn of the skis in hard snow or on icy surfaces: the snowmobile simply continues to move onward with the skis sliding sideways until they come in proper gripping engagement with the terrain; only then is adequate steering possible. Another cause for accidents is the lack of any means to steady the snowmobile when travelling on icy surfaces especially those inclined where the snowmobile tends to skid along the slope. An improved ski to prevent the above risks in practising this sport is therefore greatly needed.

It is an object of the present invention to provide an improved ski runner which will enable a snowmobile, especially when travelling on icy surfaces, to effect an immediate turn and to remain steady and maintain directional stability.

At present, the runner mounted on the ski of a snowmobile consists in a longitudinally disposed circular cross-section element made of spring steel and having its opposite end portion upwardly bent and received in two apertures longitudinally spaced along the axis of the ski element. A third aperture disposed between the other two receives a bolt centrally disposed on the runner. For assembling the runner onto the ski element, the

runner is temporarily bent into an arc and its end portions are inserted into the apertures of the ski. Upon release, the runner returns to its rectilinear form and its ends become confined to the ski. Finally, the intermediate portion of the runner is secured to the ski by means of a bolt. The ground engaging surface of the ski is designed to provide the snowmobile with optimum gripping action in soft or hard snow and on ice. However, lateral forces exerted by the terrain on the runner when the snowmobile is travelling at high speed, cause the ski runner to often break or, in most cases, to be at least longitudinally distorted. One obvious immediate alternative is to increase the diameter of the runner; however, this renders the flexing operation required during assembly of the runner to the ski most difficult and practically impossible, especially when the replacement is made in the field. Another disadvantage of present runners is that since they are brittle and wear easily when in contact with abrasive material such as dirt and sand, often encountered on icy surfaces, they must be replaced quite frequently, especially in snowmobile races where the snowmobile ski is constantly subjected to severe ground impact.

It is therefore another object of this invention to provide an improved runner which has increased strength to resist wear and lateral forces and where the flexing operation previously required during the assembling of the runner to the ski is eliminated but where a still very tight connection with the ski is provided.

The present invention involves a runner blade for use in a snowmobile ski which comprises a longitudinally extending member having vertically opposed top and bottom faces; fastening

means fixedly mounted on the top face of the member for fastening the member to the ski, the member having a longitudinally extending groove in the bottom face thereof; and a plurality of aligned pieces of cemented carbide material each having upper faces generally conforming to the groove and fixed therein and each having lower faces forming a straight edge extending below the member, the straight edges of all the pieces defining a rectilinear cutting edge parallel to the axis of said ski.

To construct the ski with a blade having a run of cemented carbides projecting downward beyond the surrounding portions of the longitudinal member provides a bearing surface which helps to stabilize the snowmobile on icy surfaces. It has been found that the front portion of this bearing surface facilitates turning of the skis while the rear portion provides a rudder effect to steady the snowmobile during its travel. It has also been found that front and rear portions of the run are determined by the prolongation of the axis of the ski leg and that, for optimum results, the length of the front portion of the run should be smaller than the length of the rear portion thereof.

The inventor has also found that an unexpectedly high improvement is obtained if the cemented carbide is a tungsten carbide such as, for example, the one known under the trademark "Carboloy". Preferably, these pieces of tungsten carbide are brazed onto the groove.

The following is a description by way of example of one embodiment of the present invention, reference being had to the accompanying drawings in which:

Fig. 1 is a side perspective view of a ski embodying a runner blade made in accordance with the present invention;



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Fig. 2 is a plan view of the ski element without the runner blade;

Fig. 3 is a longitudinal cross-sectional view taken along lines 3-3 of Fig. 2;

Fig. 4 is a transverse cross-sectional view taken along lines 4-4 of Fig. 2;

Fig. 5 is a transverse cross-sectional view taken along lines 5-5 of Fig. 2;

Fig. 6 is an enlarged cross-sectional view of the rear end portion of the ski shown in Fig. 3;

Fig. 7 is a side elevational view of the runner blade of the present invention;

Fig. 8 is a bottom view of the runner blade shown in Fig. 7;

Fig. 9 is a transverse cross-sectional view taken along lines 9-9 of Fig. 7;

Fig. 10 is a transverse cross-sectional view taken along lines 10-10 of Fig. 7;

Fig. 11 is a transverse cross-sectional view taken along lines 11-11 of Fig. 8;

Fig. 12 is an enlarged fragmented cross-sectional view taken along lines 12-12 of the runner blade shown in Fig. 8; and

Fig. 13 is a schematic view of the ski leg in relation to the runner blade and is shown on the sheet illustrating Fig. 1.

Referring now to Fig. 1, there is shown a snowmobile ski assembly 14 consisting of a ski 16 carried by a leaf spring assembly 18; the ski assembly 14 is pivotally mounted at the front end of the snowmobile and underneath the body structure 20 thereof by means of a ski leg 22 which has its upper end connec-

ted to the steering linkage (not shown) of the snowmobile. There are usually two of these ski assemblies mounted in laterally spaced relation supporting the front end of the snowmobile; however, some snowmobiles are steered with only one ski, centrally disposed at the front thereof. The snowmobile being track propelled, ski elements 16 provide the steering movement thereof.

Referring to Figs. 2-6, the ski 16 consists of a generally flat longitudinal rigid member with an upwardly bent front portion 24. The ski 16 has a ground-engaging undersurface 26 and an upper surface 28; these surfaces are generally flat except for a recessed central portion 30 which defines two outer lateral side walls 32 and 34 which contribute to the directional stability in loose snow. A series of aligned rounded projections 35, 36 and 37 extend in the central portion 30 and are each provided with holes 38, 39 and 40, respectively. Two elongated openings 42 and 44, are further provided in the central portion on opposite sides of the series of rounded projections. Referring more particularly to Fig. 4, lower surface 26 acts as a bearing surface for the ski when in soft snow, whereas on hard snow or ice covered surfaces, only the lower surface 35 of the central portion 30 would contact the ground if it were not for the addition of a runner blade.

As it is well known in the art, a runner blade (or runner shoe as it is often referred to in the trade) is essential. Its function is two-fold; first it provides directional stability in hard packed snow and icy surfaces and, secondly, it practically eliminates abrasion of the ski. In Fig. 1, a runner blade 45 is shown mounted underneath the ski in longitudinal abutment with its undersurface.

Referring more particularly to Figs. 7-12, the runner blade 45 first consists of a longitudinally extending rigid member 46, preferably circular and made of mild steel. A series of bolts 50, 51, 52 longitudinally aligned are secured on the upper face 48 of the rigid member 46; these bolts are secured thereon by having the respective head portions 54 (see Fig. 9) received in a correspondingly shaped recess 56 and fixed therein by a weld 59. It is to be noted that blade 45, shown in the present drawings, is one which is to be preferably mounted on a snowmobile used principally for racing; therefore, on standard snowmobiles, less than three fastening bolts may be used. The lower face 60 of the rigid member 46 is provided with a groove 62 which is shown having an inverted V shape in Fig. 10, but which may have any other suitable configuration. The runner blade 45 further consists of a plurality of identically shaped pieces 64 of cemented carbide secured in groove 62. Instead of having one long piece of cemented carbide, it is preferable to have a series of pieces of this material in adjacent disposition in the groove to diminish the chances of breaking. The cemented carbides 64 are of square cross-section and have their upper inclined faces 66 and 68 brazed to the inner faces 70 and 72 of the V-groove 62. Should the root of the V-groove be slightly rounded due to normal wear of the cutting tool, the carbide elements may be provided with a slight "flat" on one edge to ensure proper seating in the groove. The bottom portion of each cemented carbide 64 has its outer faces 74 and 76 forming a straight edge extending downwardly beyond the lower face 60 of the rigid member 46; the straight edges of all the pieces define a rectilinear cutting edge 71 parallel to the longitudinal axis of the ski; they provide a horizontal run intermediately disposed underneath the ski



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and serve as a bearing surface for the front end of the vehicle when travelling on ice covered surfaces. Referring to Fig. 13, there is shown an axis 65 which is the longitudinal axis of the inclined ski leg 22; the prolongation of this axis extends through the cutting edge 71 of the runner blade dividing the cutting edge into a front portion 67 and a rear portion 69. The front portion 67 of the cutting edge 71 assists in turning the skis; the rear portion 69 of the cutting edge 71 provides a rudder effect which enables the ski to maintain a steady position in its line of travel. Optimum results are obtained if the length of the front portion 67 is greater than that of the rear portion 69. The ratio of front and rear portions must be determined by trial and error because of numerous factors such as length of the skis, loading of the skis, speed, etc. In one embodiment used successfully for racing purposes, a ratio of 40% and 60% for the front and rear portions respectively was found suitable.

Referring to Figs. 7, 8 and 11 where the illustrated construction is one which is required for a snowmobile principally used for racing, an additional piece of cemented carbide 78 of triangular cross-section is also brazed in the front end section of groove 62 with its upper faces 77 and 79 conforming with the shape of the groove; this additional piece of cemented carbide which is deprived of a cutting edge, is inserted in the groove only to protect the surrounding portion of the lower face 60 of the rigid member 46 from excessive wear; this additional carbide may not be required on standard snowmobiles. Furthermore, to increase the wear resistance of these carbides, piece 78 and the first piece 64' of the series of carbides 64, are both provided with inclined front walls 80 and 82, respectively. The

sizes of the cemented carbide elements are not too critical. The elements should be relatively short, of the order of one inch, and their side faces from about 1/8 of an inch to about 3/16th wide. The shape of their upper half may also differ from that shown in Fig. 9 so long as it conforms to the groove of the rod. The V-groove, however, is very easy to make and square carbide elements may be stock components.

It has been found that a very hard cemented carbide suitable for use on snowmobiles is one known under the trademark "Carboloy" which is a tungsten carbide and an extremely hard alloy.

Another important aspect of the present invention is the easiness of assembling the runner blade 45 to the ski 16. As previously mentioned, the prior assembling operation consisted in curving by flexing the runner blade so that its opposite end portions could be inserted into slots (similar to slots 42 and 44 described above) which were separated from one another a distance smaller than that separating the end portions of the runner shoe. However, in the present case, to assemble the runner blade to the ski element, no longitudinal bending of the runner shoe 46 is required: the assembly is effected by first entering the front end portion 84 of the runner shoe through slot 44 so that it may bear on the inside surface of the central portion 30. The rear end portion 86 is then inserted through slot 42, thereby effecting the insertion of bolts 50, 51 and 52 through holes 38, 39 and 40 respectively, the rounded projections 35, 36 and 37 receiving the associated welds 57, 58 and 59. The runner shoe is then fastened to the ski element by securing means such as nut

88 and washer 90. The ski element thus formed is one which will provide greater resistance to lateral forces exerted thereon. The chances of having a runner blade which will become distorted, are greatly reduced because of the presence of separate pieces adjacent one another and the easiness with which a runner blade may be replaced in the eventuality that such a blade would become defective, now enables the snowmobiler himself to replace such damaged blade at home or in the field; furthermore, in snowmobile races, this change may now be effected very quickly.

10 While the invention as been described above, only in relation to one specific form of the invention, persons skilled in the art will be aware that it may be refined and modified in various ways without departing from its scope. We therefore wish to have it understood that this invention is not to be limited in interpretation except by the terms of the following claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A runner blade for use in a snowmobile ski comprising a longitudinally extending member having vertically opposed top and bottom faces; fastening means fixedly mounted on the top face of said member for fastening said member to said ski, said member having a longitudinally extending groove in said bottom face thereof; and a plurality of aligned pieces of cemented carbide material each having upper and lower faces, the upper faces generally conforming to said groove and being fixed therein, the lower faces forming a straight edge extending below said member, the straight edges of all said pieces defining a rectilinear cutting edge parallel to the axis of said ski.

2. A runner blade for use in a snowmobile ski comprising a longitudinally extending rigid member having vertically opposed top and bottom faces; a series of aligned fastening means fixedly mounted on the top face of said member for fastening said member to said ski; said member having a longitudinally extending groove in said bottom face thereof; and a plurality of aligned pieces of cemented carbide material intermediately disposed in said bottom face; each of said cemented carbide material having upper faces fixedly secured in said groove and having lower faces forming a straight edge extending downwardly beyond said rigid member, the straight edges of all said pieces defining a rectilinear cutting edge parallel to the axis of said ski.

3. A runner blade as defined in claim 2 wherein said groove extends to the front end portion of said rigid member and



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wherein an additional cemented carbide material is secured in said groove at said front end portion, said additional piece of cemented carbide material having upper faces conforming to said groove and a flat lower surface.

4. A runner blade as defined in claim 1, 2 or 3 wherein said cemented carbide material is a tungsten carbide and wherein the upper faces thereof are brazed to correspondingly shaped faces in said groove.

5. In a ski assembly mounted at the front end of a snowmobile for the steering movement thereof, a ski having a top surface, a ground-contacting bottom surface and a downwardly recessed central portion extending longitudinally of said ski, said central portion having at spaced intervals thereon a plurality of apertures extending therethrough, a runner blade adapted to be fastened longitudinally in abutment with the bottom surface of said ski, said runner blade including a longitudinally extending rigid member having upwardly bent end portions extending through two apertures of said plurality of apertures, said member having vertically opposed upper and lower faces, serially aligned fastening means fixedly mounted on the upper face of said rigid member and each extending through the remaining apertures of said plurality of apertures, said member having a longitudinally extending groove in said lower face thereof, a plurality of aligned pieces of cemented carbide material, each having upper faces fixed in said groove and generally conforming thereto and lower faces forming a straight edge extending below said member, the straight edges of all said pieces defining a rectilinear cutting edge parallel to the axis of said ski.

6. In a ski assembly as defined in claim 5 wherein said ski is supported by a ski leg having one end attached to the ski and the other end attached to the front end of the snowmobile, said ski leg having a longitudinal axis prolonging through said rectilinear cutting edge, thereby dividing said edge in a front end portion and a rear end portion, said front end portion having a length substantially smaller than that of said rear end portion, said front end portion facilitating steering of said ski while said rear end portion providing a rudder effect to stabilize said snowmobile when travelling on ice covered surfaces.

7. In a ski assembly as defined in claim 6 wherein said groove extends to the front end portion of the member and wherein an additional piece of cemented carbide material is secured in said groove at said front end portion and is provided with upper faces conforming to said groove and a flat lower surface.

8. In a ski assembly as defined in claim 5, 6 or 7 wherein said cemented carbide material is a tungsten carbide and wherein said longitudinally extending member is generally circular in cross-section except for its generally flat front and rear end portions, said member being made of mild steel.

9. In a ski assembly as defined in claim 6 wherein said front and rear end portions of said cutting edge have a ratio of about 40% and 60% respectively.

10. In a ski assembly as defined in claim 6 or 7 wherein said carbide elements have a length of about one inch and a width of about 1/8 of an inch, to about 3/16 of an inch.

11. A runner blade as defined in Claim 1, 2 or 3 wherein said pieces of cemented carbide are of square cross-section and wherein the edge of each piece received in said groove and disposed opposite the cutting edge includes a flat portion to ensure proper seating in said groove.



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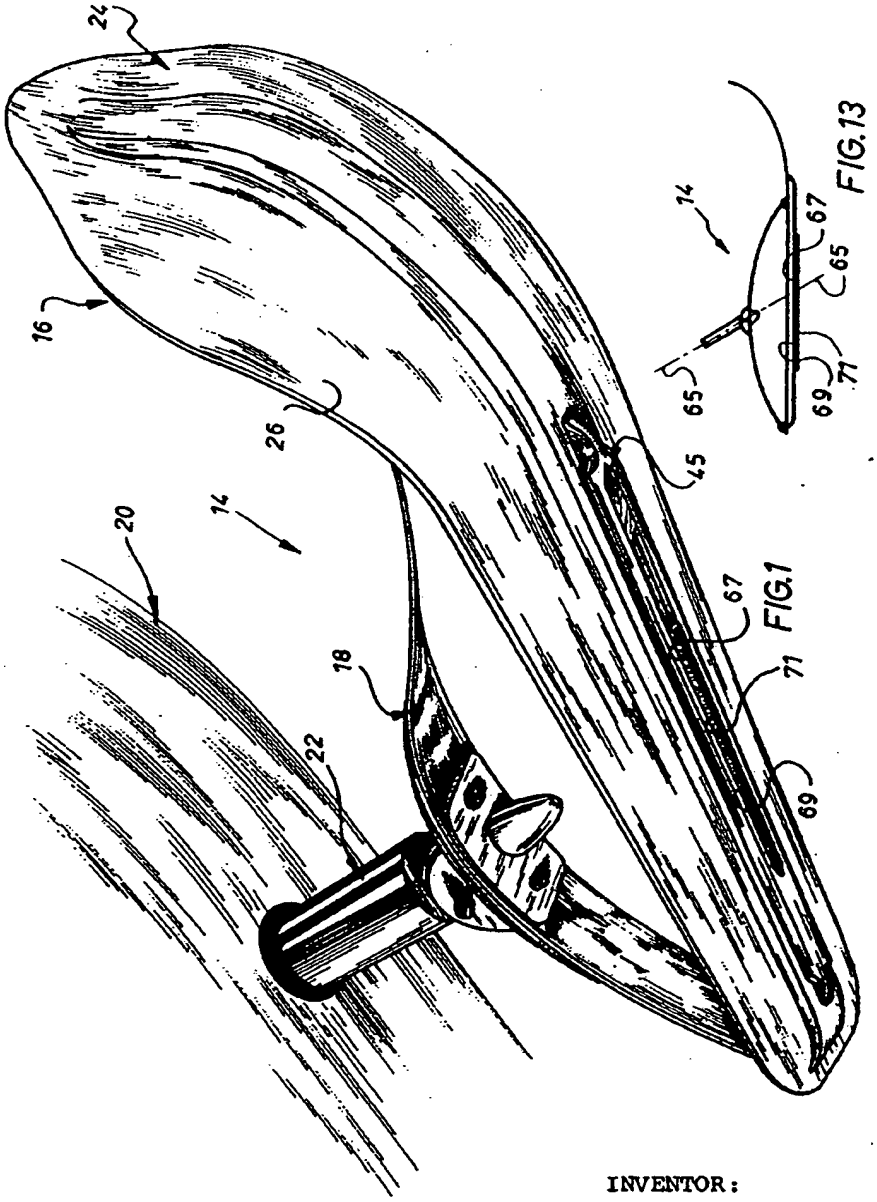


FIG.1




FIG.13

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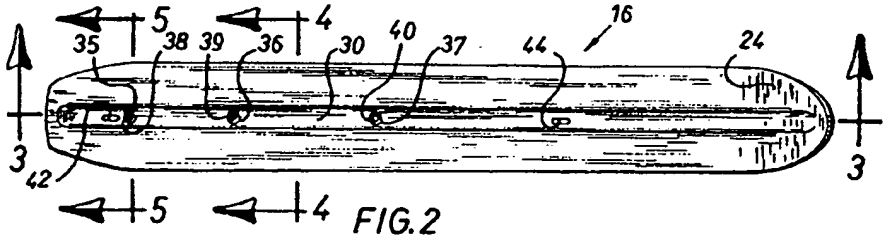


FIG.2

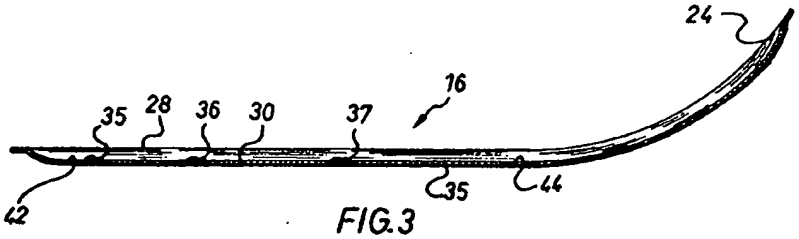


FIG.3

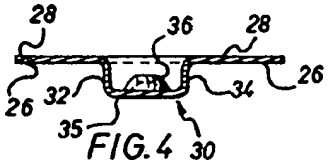


FIG.4

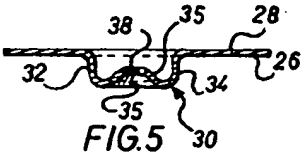


FIG.5

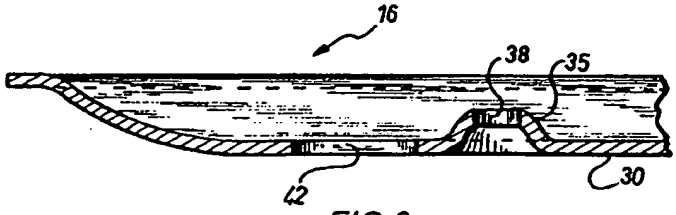


FIG.6

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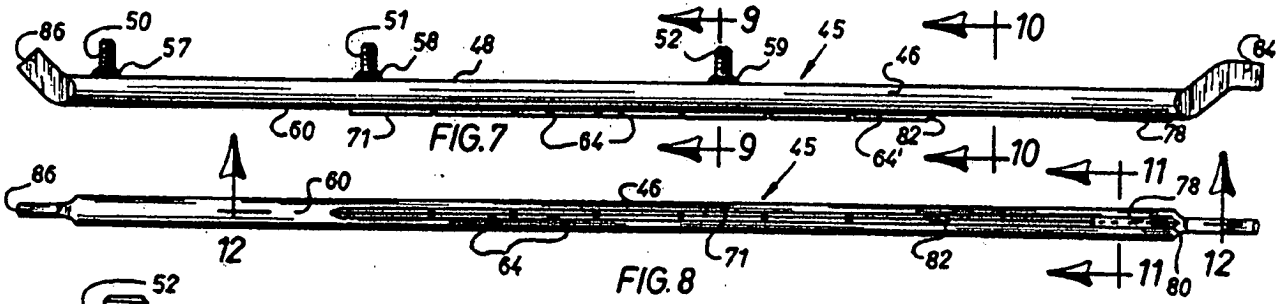


FIG. 7

FIG. 8

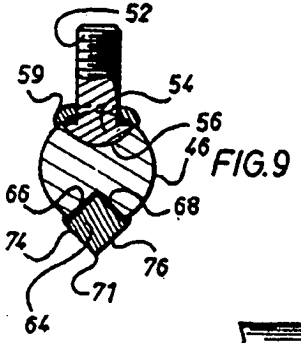


FIG. 9

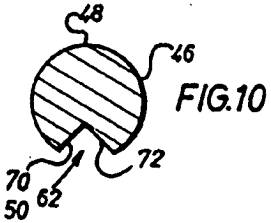


FIG. 10

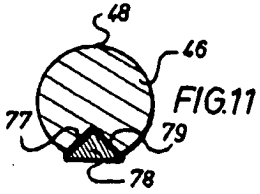


FIG. 11

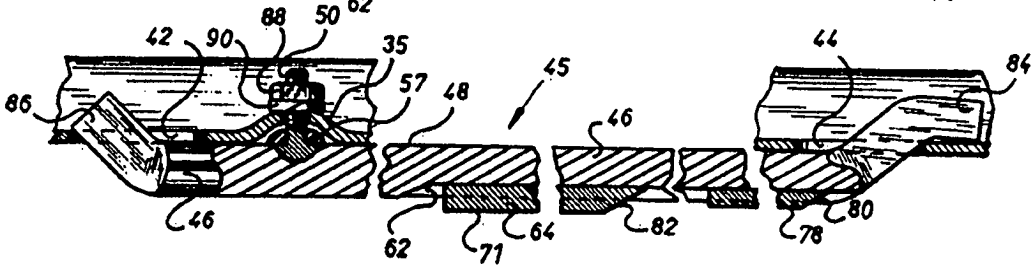


FIG. 12

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